

बिलासपुर विश्वविद्यालय

बिलासपुर (छत्तीसगढ़)



पाठ्यक्रम

निम्नलिखित विज्ञान - लिंक

निम्नलिखित रसायन पाठ्यक्रम

रसायन रसायन / रसायन रसायन रसायन (अंश) गणित

परीक्षा : 2014

:: प्रकाशक ::

कुलसचिव बिलासपुर विश्वविद्यालय

बिलासपुर (छत्तीसगढ़)

ORDINANCE NO 39

Master of Science Examination

1. The examination for the degree of Master of Science consist of two parts
 - (A) The Previous examination and
 - (B) The Final Examination.
2. A candidate who after obtaining the degree of Bachelor of science the University or an examination of any statutory University in any statutory University in India which has been recognised by they University as equivalent to B.Sc. degree of the University and has completed a regular course of study in the teaching department of the University in the subject in which he offers himself for examination for one academic year shall by admitted to the previous examination for the degree of master of Science.
 Provided however every candidate shall offer for the Previous Examination one of the subjects offered by his/her B.Sc. Degree.
 Provided further (i) for admission of M.A. /M.Sc. Final (Maths) and candidate must have offered Maths as one of the subject in B.Sc. (ii) for admission in M.A. /M.Sc. Final (Maths) preference will be given to those candidates who offered Maths as one of their subject in B.Sc.
3. A candidate who after passing the M.Sc. previous Examination of the University has completed a regular course of study for one academic year in a teaching department of the University or in a College affiliated to the University shall be admitted to the Final Examination for the degree of Master of Science in the subject in which he/she has passed the Previous examination.
 A Candidate who has passed the previous examination for the degree of Master of Science of another University may also be admitted to the final Examination for the degree of Master of Science after obtaining necessary permission from the Kulpati, provided that he offered for his previous Examination a course of study of an equivalent standard with almost identical syllabus as is required for the Previous Examination of this University, and has attended a regular course of study for one academic year in a College affiliated to the University teaching department of the University.
4. The examination shall be partly by meant of paper and partly practical including sessional, except in the case of Mathematics where

- the examination shall be paper only.
5. Besides regular students and subject to other compliance with his ordinance, ex-students and non collegiate candidates shall be eligible for admission to the examination as per provision or ordinance No. 6 relating to Examination shall be paper only.
 Provided that non- collegiate candidate shall be permitted to offer only such subjects/papers as are taught to the regular students at any of University teaching Department of College.
 6. The Subject of the Examination shall be of the following :

(i) Mathematics	(ii) Physics
(iii) Chemistry	(iv) Zoology
(v) Botany	(vi) Geology

 A candidate who has passed the M.Sc. Examination of the University shall be allowed to present himself for the M.Com. Examination in any one of more of the optional papers in that subject not taken by him at the said examination and is successful with be given a certificate to that effect.
 7. From the session 1986 - 87 for the Previous Examination, candidate must obtain for a pass atleast 36% in each theory and Practical and 36% of the aggregate marks in the Theory and Practical separately in each examination. The above provision of 36% in each paper shall be applicable for Final Examination from the academic session of 1987-88.
 8. No division will be assigned on the result of the Previous Examination the division in which a candidate is placed shall be determined on the basis of aggregate of marks obtained in both. the M. Sc. Previous and M.Sc. Final Examination.
 9. Successful candidates who obtain 60% or more of the aggregate marks shall be placed in the first Division, those obtaining less than 60% but not less 48% in the second Division and all other successful candidate obtaining less than 48% in the Third Division.
 10. Candidates who gave passed the M.Sc Examination of the University in any subject in Third or Second Division and desire to appear at the M.Sc. Examination in the same subject for improving division without attending a regular course of study in a College affiliated to the University or in a Teaching Department of the University be allowed to appear at the aforesaid examination an non-collegiate student on the following conditions.

- (i) There shall be only two Division for such candidates the First division and second Division. The Marks required for obtaining these division shall be the same as prescribed in the ordinance i.e. examinees who are successful in Final of the Examination. and have obtained 60% or more aggregate of the marks in Previous and Final Examination taken together shall be placed in the First Division and Examinees who are successful in Final Examination and have obtained less than 60% but not less than 48% of aggregate marks in previous and Final examination taken together shall be placed in the Second Division.

- (ii) The result of the candidates obtaining less than 48% of the aggregate marks in previous and Final Examination taken together shall not be declared.

- (iii) Candidates shall have the option to appear at both the previous and final examination in one and the same year and for being successful at the examination, the candidates shall obtain 48% of the aggregate marks.

Provided that such candidates who opt to appear in previous and final examination separately shall have to obtain minimum aggregate required for the previous examination but he will have to obtain atleast 48% in the aggregate of previous and final examination taken together or else his result will be canceled.

- (iv) The syllabus for the examination shall be same as prescribed for the year in which the examination is held.
- (v) Not more than to attempt shall be allowed to such a candidate. Failure of appearance at the examination after permission has been accorded by the University shall be counted as an attempt.

provided however such candidates who to appear at the previous and final examination separately will be allowed only one attempt of the previous examination and two attempts at the final examination.

- (vi) Candidates who wish to avail the opportunity given in foregoing paraes will have to apply for permission as required in the Ordinance relating to admission of non - collegiate students to the University examination along with registration fee.

- (vii) In case, a student improves his division under provision of this para, the fresh Degree will be issued after cancelling his first Degree.

M.A./M.Sc. Mathematics (Final)

Session 2005 - 2006

There shall be two compulsory and three optional papers of 100 marks each Students can choose any three optional papers out of ten.

~~AD-8553~~ DETAILS OF SYLLABUS A-1511

M.A./M.Sc.(Final) Mathematics Compulsory Paper - I

Integration Theory

Signed measure Hahn decomposition theorem, mutually singular measures. Radon -Nikodym Theorem. Lebesgue decomposition Riesz representation theorem. Extension theorem (Carathéodory) Lebesgue stieljes integral, product measures, Fubini's theorem. Differentiation and Integration. Decomposition into absolutely continuous and singular parts.

Baire sets. Baire measure, continuous functions with compact support. Regularity of measures on locally compact spaces.

Functional Analysis

Normed Linear spaces. Banach spaces and examples. Quotient space of normed linear spaces and its completeness. equivalent norms Lemma. basic properties of finite dimensional normed linear spaces and compactness. Weak convergence and bounded. linear transformations. normed linear spaces of bounded linear transformations dual spaces with examples Uniform boundedness theorem and some of its consequences. Open mapping and closed graph theorems. Hahn -Banach Theorem for real linear spaces. complex linear spaces and normed linear spaces. Reflexive spaces. Weak Sequential Compactness. Compact Operators. Solvability of linear Equations in Banach spaces. The closed Range Theorem.

Inner product spaces. Hilbert spaces. Orthonormal Sets. Bessel's inequality. Complete orthonormal sets and Parseval's identity. Structure of Hilbert spaces. Projection theorem. Riesz representation theorem. Adjoint of an operator on a Hilbert space. Reflexivity of Hilbert spaces. Self-adjoint operators, Positive, projection, Normal and Unitary operators.

Text Book

1. C. Goffman and G. Pedrick, First Course in Functional Analysis, Prentice Hall of India, New Delhi. 1987.
2. B.V. Limaye Functional Analysis, Wiley Eastern Ltd.
3. G.de. Barra: Measure Theory and Integration, Wiley E.Ltd 1981.

References

1. H.L. Royden. Real Analysis, Macmillan Publishing Co. Inc. New York 4th Edition. 1993.
2. S.K. Berberian Measure and integration, Chelsea Publishing Company New York 1965.
3. P.R. Halmos. Measure, Theory, Van Nostrand, Princeton, 1950.
4. T.G. Hawkins, Lebesgue's Theory of Integration: Its Origins and Development, Chelsea, New York 1979.
5. R.G. Bartle. The Elements of Integration, John Wiley & Sons, Inc. New York. 1966.
6. Serge Lang. Analysis I & II Addison Wesley Publishing Company Inc. 1967.
7. Inder K. Rana An Introduction to Measure and Integration, Narosa Publishing House, Delhi 1997.
8. Walter Rudin, Real & Complex Analysis, Tata McGraw Hill Publishing.
9. Edwin Hewitt and Kari Stromberg, Real and Abstract Analysis, Springer - Verlag. New York.
10. Edwin Hewitt and Kenneth A Ross, Abstract Harmonic Analysis, Vol. 1, Springer Verlag. 1993.
11. G. Bachman and L. Narici, Functional Analysis, Academic Press, 1966.
12. N. Dunford and J.T. Schwartz Linear Operators, Part I Interscience, New Delhi.
13. R.E. Edwards. Functional Analysis Holt Rinehart and Winston, New York 1965.
14. P.K. Jain O.P. Ahuja and Khalil Ahmed Functional Analysis, New Age International (P) Ltd. & Wiley Eastern Ltd, New Delhi. 1997.
15. R.B. Holmes, Geometric Functional Analysis and its Applications, Springer-Verlag - 1975.
16. K.K. Jha Functional Analysis Students Friends 1986.
17. L.V. Kantorovich and G.P. Akilov, Functional Analysis, Pergamon press, 1982.
18. E. Kreyszig, Introductory Functional Analysis, with Applications John Wiley & Sons New York 1978.
19. B.K. Lahiri, Elements of Functional Analysis, The World Press Pvt. Ltd. Calcutta. 1994.
20. B. Choudhary and Sudarshan Nanda, Functional Analysis with Application, Wiley Eastern Ltd. 1989.
21. L.A. Lustenik and V.J. Sobolev, Elements of Functional Analysis

- Hindustan Publishing Corporation New Delhi. 1971.
22. G.F. Simmons Introduction to Topology and Modern Analysis, McGraw Hill Book Company, New York 1963.
23. A.E. Taylor, Introduction to Functional Analysis, John Wiley and Sons, New York 1958.
24. K. Yosida Functional Analysis 3rd edition Springer-Verlag, New York, 1971.
25. Walter Rudin, Functional Analysis, Tata McGraw - Hill Publishing Company Ltd. New Delhi. 1973.
26. A. Wilansky, Functional Analysis, Blaisdell Publishing Co. 1964.
27. J. Tinsley Oden & Leszek F. Demkowicz Applied Functional Analysis CRC Press Inc. 1996.
28. A. Siddiqui, Functional Analysis with Application Tata McGraw - Hill Publishing Company Ltd, New Delhi.

M.A./M.Sc. (Final) Mathematics**2005 - 2006****Compulsory Paper- II****Partial Differential Equations, mechanics & Gravitation MM. : 100**

Partial Differential Equations

Examples of PDE. Classification.

Transport Equation - Initial Value problem Non - homogeneous Equation.**Laplace's Equation** - Fundamental Solution, Mean Value Formulas, Properties of Harmonic Functions, Green's Function, Energy Methods.**Heat Equation** - Fundamental Solution, Mean Value Formula, properties of Solutions, Energy Methods.**Wave Equation Solution** by Spherical means, Homogeneous Equations, Energy Methods.**Nonlinear First Order PDE** - Complete Integrals, envelopes, Characteristics, Hamilton Jacobi Equations (Calculus of Variations, Hamilton's ODE, Legendre Transform, Hopf - Lax Formula, Weak Solutions, Uniqueness,) Conservation Laws (Shocks Entropy Condition Lax - Oleinik Formula Weak Solutions, Uniqueness, Riemann's problem Long Time Behaviour)**Representation of Solutions** - Separation of Variables, Similarity Solutions (Plane and Travelling Waves, Solutions Similarity under Scaling) Fourier and Laplace Transforms, Hopf - Cole Transform, Hodograph and Legendre Transforms, Potential Functions, Asymptotics (Singular Perturbations Laplace's method, Geometric Optics, Stationary

Phase, Homogenization), Power Series (Non characteristic Surfaces, Real Analytic Functions, Cauchy - Kovalevskaya Theorem.)

MECHANICS

Analytical Dynamics

Generalized coordinates. holonomic and Non - holonomic systems. Scleronomous and Rheonomous systems. Generalized potential Lagrange's equations of first kind. Lagrange's equations of second kind. Uniqueness of solution, Energy equation for conservative fields.

Hamilton's variables. Donkin's theorem, Hamilton canonical equations. Cyclic coordinates. Routh's equations, Poisson's Bracket. Poisson's identity. Jacobi - Poisson Theorem. Motivating problems of calculus of variations, Shortest distance Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic. Fundamental lemma of calculus of variations, Euler's equation for one dependent function and its generalization to (i) Independent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

Gravitation.

Attraction and potential of rod, disc, spherical shells and sphere, Surface integral of normal attraction (application & Gauss, theorem,) Laplace and Poisson equations, Work done by self attracting systems, Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics Surface density in terms of surface harmonics.

Text Book

1. L.C. Evans: Partial Differential Equations, ams Vol. 19, 1998.
2. H. Goldstein, Classical mechanics (2nd edition), Narosa Publishing House New Delhi.
3. S.L. Loney and Elementary treatise on statics, Kalyani Pub. New Delhi. 1979.

References:

1. A.S. Ramsey, Dynamics Part II, The English Language Book Society and Cambridge University Press. 1972.
2. F. Gantmacher, Lectures in Analytic Mechanics, MIR Publishers, Moscow. 1975.
3. Narayan Chandra Rana & Pramod Sharad Chandra Joag, Classical Mechanics, Tata McGraw - Hill, 1991.
4. Louis N Hand and Janet D. Finch Analytical Mechanics, Cambridge University Press, 1998.

M.A/M.Sc.(Final) Mathematics

Optional Paper - I

Fundamentals of Computer Science & Data structure

A-1514

M.M. 100

Note : Five question out of 10 questions to be attempted.

Computer Basics Introduction to computers with characteristics and their uses, Structure of computers, Micro, Mini and Mainframe computer, Data representation, Numbering system and their arithmetic, Fixed point and floating point representation of overflow and underflow conditions using 7-bit and 8-bit registers, Error detection and correction codes.

Input devices and computer Memory Description of various input / output units of computers, VDU, OMR, OCR, Basic coding, Memory organization, Memory cells, Read only memory, Serial access memory, Physical devices used to construct memory.

Computer architecture and operating system Inter-connection of units, Memory of processor, I/O to processor communication, Interrupt, objectives of an operating system Function of an operating system, types of an operating system - batch, multiprogramming, online and real time operating system.

Computer and communication : Computer Network technology, Communication protocols, Different topologies Linear Circular star, tree concept of LAN, WAN, MAN concept of Repeater, Bridge, Router, Gateway, Modern FTP, Electronic - mail Vsnnet.

Concept of Data - structure, Type and operations, Algorithms, complexity Time, space, Trade off. Linked List : Representation, Traversal, searching Instruction into a linked list (First, mid & last position with algorithm) deletion stacks, queues, Recursion, Array representation of stacks, Arithmetic expressions (Polish Notation) Application Recursion and queues.

Trees - Binary trees, representation, traversal, Binary search trees, searching and inserting in Binary search, Deleting in a Binary search tree General tree.

sorting : Insertion, quick, heap, bubble & merge, selection sort,

Text Book : 1. C.T. date Introduction to Database System Addison Wesley

2. Fundamentals of computer Rajarama.

M.A/M.Sc.(Final) Mathematics**Optional Paper - II**

A-1513

M.M. 100

1. Programming in C (With ANSI Features).

An overview of programming. Programming language, Classification.

C Essentials-Program Development. Functions. Anatomy of a C Function. Variables are Constants Expressions. Assignment Statements. Formatting Source Files. Continuation Characters. The Preprocessor.

Scalar data types Declarations, Different types of integers Different kinds of Integer constants Floating point types, Initialization, Mixing types, Explicit conversions

Casts, Enumeration types, The void data type, Typedefs, Finding the address of an object Pointers, control Flow-Conditional Branching, The switch statement Looping Nested Loops The Break and continue statements The goto statement Loops : while loop, for loop break loop, do.....while loop, The if statement the if.....else.....statement)

Operators and Expressions-Precedence & Associativity, Unary Plus and Minus operators. Binary Arithmetic Operators, Arithmetic Assignment Operators. Increment and Decrement operators, comma Operators. Relational Operators. Logical Operators Bit - Manipulation operators, Bitwise Assignment Operators. Cast Operator. Size of Operators. Conditional Operator Memory Operators.

Arrays and Pointers-Declaring an Array. Arrays and Memory. Initializing arrays. Elements through Pointers. Passing Arrays as Function Arguments. Sorting Algorithms. Strings. Multidimensional Arrays of Pointers to Pointers.

Storage Classes-Fixed vs. Automatic Duration. Scope. Global variables. The register Specifier. ANSI rules for the syntax and Semantics of the storage-class keywords. Dynamic Memory Allocation.

Structures and Union- Structures. Linked Lists. Unions enum Declarations.

The C Preprocessor-Macro substitution. Conditional Compilation. Include Facility. Line Control

Input and Output-Streams, Buffering. The <Stdio.h> Header file Handling. Opening and Closing File. Reading and Writing Data. Selecting an I/O Method. Unbuffered I/O Random access. The standard library for Input/Output.

Recommended Text.:

1. Peter a. Darnell and Philip E. Margolis, C: A Software Engineering

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approach, Narosa Publishing House (Springer International Student Edition) 1993.

References

2. Samuel P. Harkison and Gly L. Steele Jr.C: A Reference Manual. 2nd Edition, Prentice Hall, 1984.
3. Brian W. Kernighan & Dennis M. Ritchie, The Programme Language, 2nd Edition (R features), Prentice Hall 1989.

M.A/M.Sc.(Final) Mathematics**Optional Paper - V**

A-1515

M.M. 100

4. Difference Equations

Introduction, Difference Calculus- The Difference Operator, Summation, Generating functions and approximate summation.

Linear Difference Equations - First order equations .General results for linear equations .Equations with constant coefficients. Applications, Equations with variable coefficients. Non Linear equations that can be linearized. The z - transform.

Stability Theory - Initial value problems for linear systems stability of linear systems. Stability of nonlinear systems. Chaotic behaviour.

Asymptotic methods- Introduction, Asymptotic analysis of sums. Linear equations. Nonlinear equations.

The Self- Adjoint second order linear equation, Introduction. Sturmian theory, Green's functions, disconjugacy, The Riccati Equations. oscillation.

The Sturm - Liouville problems Introduction, Finite Fourier Analysis A Non- Homogeneous problem.

Discrete Calculus of Variations - Introduction Necessary conditions, Sufficient Conditions and Disconjugacy.

Boundary Value problems for Nonlinear equations - Introduction The Lipschitz case. Existence of Solutions. Boundary Value Problems for Differential Equations.

Text Book -

Walter G. Kelley and Allan. C Peterson - Difference Equations. An Introduction with Applications. Academic Press Inc. Harcourt Brace Jorandovich Publishers. 1991.

References:

Calvin Ahlbrandt and Allan C. Peterson. Discrete Hamiltonian Systems, Difference Equations Continued fractions and Riccati equations, Kluwer, Boston 1996.

~~4538~~ **M.A/M.Sc.(Final) Mathematics**
Optional Paper - VI

~~8558~~ ~~AM-1576~~ **5. Fluid Mechanics** M.M.100
~~A-1516~~

Kinematics- Lagrangian and Eulerian methods. Equation of continuity. Boundary surfaces. Stream lines. path lines and streak lines. Velocity potential. Irrotational and rotational motions. Vortex lines.

Equations of Motion- Lagrange's and Euler's equations of motion. Bernoulli's Theorem. Equation of motion by flux method equations referred to moving axes. impulsive actions. Stream function. Irrotational motion in two dimensions. Complex velocity potential. Sources, Sinks, doublets and their images. Conformal mapping Milne-Thomson circle theorem.

Two dimensional irrotational motion produced by motion of circular, coaxial and elliptic cylinders in an infinite mass of liquid kinetic energy of liquid, Theorem of Blasius. Motion of a sphere through a liquid at rest at infinity. liquid streaming past a fixed sphere. Equation of motion of a sphere. Stoke's stream function.

Vortex motion and its elementary properties Kelvin's proof of permanence Motions due to circular and rectilinear vortices Wave motion in a gas. Speed of sound. Equation of motion of a gas. Subsonic, sonic and supersonic. flows of a gas. Isentropic gas flows. Flow through a nozzle. Normal and oblique shocks.

Text Book

1. W.h. Besaint and A.S. Ramsey, A Treatise on Hydromechanics. Part II CBS Publishers, Delhi. 1988.
2. R.K. Rathy, An Introduction to Fluid Dynamics. Oxford and IBH Publishing Company, New Delhi. 1976.

References.

1. G.K. Batchelor, An Introduction to Fluid mechanics, Foundation Books, New Delhi. 1994.
2. F. Choriton, Textbook of Fluid Dynamics, C.B.S. Publishers, Delhi. 1985.
3. A.J. Chorin and A. Marsen. A Mathematical Introduction to Fluid Dynamics, Springer-Verlag, New York. 1993
4. L.D. Landau and E.M. Lipschitz. Fluid Mechanics. Pergamon press. London 1985.
5. H. Schlichting. Boundary Layer Theory. McGraw Hill Book

Company. New York. 1979.

6. A.D. Young Boundary layers, AIAA Education Series, Washington D.C. 1989.
7. S.W. Yuan. Foundations of Fluid Mechanics Prentice Hall of India private Limited, New Delhi. 1976.

M.A/M.Sc. (Final) Mathematics
Optional Paper - VII

~~8559~~ ~~AM-1577~~ ~~4539~~ **6. Information Theory** M.M.100
~~A-1517~~

Measure of Information - Axioms for a measure of uncertainty. The Shannon entropy and its properties. Joint and conditional entropies. Transformation and its properties.

Noiseless coding - Ingredients of Noiseless coding problem. Uniquely decipherable codes. necessary and Sufficient condition for the existence of instantaneous codes. Construction of optimal codes.

Discrete memoryless Channel Classification of channels information processed by a channel. Calculation of channel capacity Decoding schemes. The ideal observer. The fundamental theorem of information theory and its strong and weak converses.

Continuous - Channels - The time - discrete Gaussian channel Uncertainty of an absolutely continuous random variable - The converse to the coding theorem for time discrete Gaussian channel. The time - continuous Gaussian channel Band - limited channels.

Some intuitive properties of a measures of entropy - symmetry, normalization, expansibility boundedness recursivity maximality, stability, additivity, subadditivity, nonnegativity, continuity, branching, etc. and interconnections among them Axiomatic characterization of the Shannon entropy due to Shannon and Fadeev.

Information functions, the fundamental equation of information, information functions continuous at the origin, nonnegative bounded information functions. measurable information functions and entropy Axiomatic characterizations of the Shannon entropy due to Tverberg and Leo. The general Solution of the fundamental equation of information. Derivations and their role in the study of information functions.

Text Book.

1. R.Ash. Information, Theory, Interscience Publishers, New York, 1965.
2. F.M Reza. An Introduction to Information Theory, MacGraw - Hill Book - Company Inc. 1961.

3. J. Aczel and Z. Dacoczy, On measures of Information and their characterizations .Academic Press, New York.

M.A/M.Sc.(Final) Mathematics

Optional Paper - VIII

7. Operations Research

Operation Research and its Scope necessity of Operations Research in Industry.

Linear Programming- Simplex Method. Theory of the Simplex Method. Duality and Sensitivity Analysis.

Other Algorithms for Linear Programming. Dual Simplex method. Parametric Linear Programming Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming.

Transportation and Assignments Problems.

Network Analysis Shortest Path Problem. Minimum Spanning Tree Problem maximum Flow Problem Minimum Cost Flow Problem Network Simplex Method Project Planning and Control with PERT- CPM.

Dynamic Programming Deterministic and Probabilistic Dynamic programming.

Game Theory - Two Person Zero - Sum Games .Games with Mixed Strategies Graphical Solution .Solution by Linear Programming Integer Programming Branch and Bound Technique.

Application to Industrial Problem - Optimal product mix and activity levels. Petroleum refinery operations. Blending problems Economic Interpretation of dual Linear programming problems .Input output analysis. Leontief system. Indecomposable and Decomposable economies.

Text Book

1. Kanti Swarup, P.K. Gupta and Man Mohan, Operations, Research, Sultan Chand & Sons. New Delhi.
2. Prem Kumar Gupta and D.S. Hira. operations Research -An Introduction S.Chand & Company Ltd. New Delhi.

References:

1. F.S. Hillier and G.J. Lieberman. Introduction to operations Research (Sixty Edition) McGraw Hill International Edition, Industrial Engineering Series, 1995. (This Book comes with a CD containing tutorial software.)
2. G. Hadley, Linear Programming. Narosa Publishing House, 1995.
3. G. Hadley Nonlinear and Dynamic Programming, Addison Wesley, Reading Mass.

4. Mokhatar S. Bazaraa. John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley & Sons New York . 1990.
 5. H.A. Taha, Operations Research - An Introduction, Macmillan Publishing Co. Inc. New York.
 6. S.S. Rao Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi.
 7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East West Press Pvt. Ltd. New Delhi Madras.
 8. Lindo Systems Products (Visit website <http://www.Lindo.com/products.html>)
 - i. Lindo (the linear programming solver)
 - ii. Lindo Callable Library (The premier Optimization engine).
 - iii. Lingo (the Linear, non - linear and integer programming solver with mathematical modeling language.)
 - iv. What's Best ! (the spreadsheet add-in that solves. linear, non-linear, and integer problems.)
- All the about four Products are huddled into one Package to From the solver Suite, For more details about any of the four products one has to click on its name.
- v. Optimization Modeling with Lindo (5th edition) by Linus Schrage.
 - vi. Optimization Modeling with Lingo by linus schrage.
- More details available on the Related Books. Page.

M.A./M.Sc (Final) Mathematics

Optional Paper - IX

8. Fuzzy Sets and Their Applications For Annual Course.

Fuzzy Sets Basic definitions α (Alpha) level sets. Convex fuzzy sets. Basic operation on fuzzy sets.

Types of fuzzy sets. Cartesian products. Algebraic products. Bounded sum and differenced. T - norms and t - Conorms.

The Extensions Principle - The Zadeh's extension principle . Image and inverse image of fuzzy sets fuzzy numbers. Elements of fuzzy arithmetic.

Fuzzy Relations and Fuzzy Graphs - Fuzzy relations on fuzzy sets. Composition of fuzzy relations Min - Max composition and its properties. Fuzzy equivalence relations. Fuzzy compatibility relations Fuzzy relation equations. Fuzzy graphs. Similarity relation.

Possibility Theory - Fuzzy measures. Evidence Theory. Necessity measure. Possibility measure. Possibility distribution. Possibility theory and fuzzy sets. Possibility theory versus probability theory.

Fuzzy Logic - An overview of classical logic, Multivalued logics. Fuzzy propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference form conditional fuzzy propositions. The compositional rule of inference.

Approximate Reasoning - An overview of fuzzy expert system. Fuzzy implications and their selection. Multiconditional approximate reasoning. The role of fuzzy relation equation.

An Introduction to Fuzzy control - Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification. Defuzzification and the various defuzzification methods (The centre of area, the centre of maxima, and the mean of maxima methods)

Decision Making in Fuzzy Environment - Individual decision making. Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods. Fuzzy linear programming.

Text Book

1. G.J. Klir and B. Yuan - Fuzzy sets and Fuzzy logic, Prentice Hall of India. New Delhi 1995.
2. H.J. Zimmermann, Fuzzy set theory and its applications, 2nd Edn, Allied Publishers Ltd. New Delhi. 1996.

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